

**“YOU HAVE MAIL” A PIGEON HOLE
MONITORING SYSTEM FOR FKE OFFICE**

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Bachelor of Mechatronics Engineering

June 2012

“I hereby declare that that I have read through this report entitle ““*You Have Mail*” A *Pigeon Hole Monitoring System for FKE Office*” and found that it has comply the partial fulfillment for awarding the degree of *Bachelor of Mechatronics Engineering*.”

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OFFICE**

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**A report in partial fulfillment of the requirements for the degree
of Bachelor of Mechatronics Engineering**

Faculty of Electrical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

YEAR 2012

I declare that this report entitle “*You Have Mail*” *A Pigeon Hole Monitoring System for FKE Office*” is the result of my own research except as cited in the references. The report has not accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :

Name :

Date :

To my beloved mother and always in memory father

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In the process of completing the PSM and report, I received a lot of help from my supervisor, lecturers, friends and family. I would like to take this opportunities to express my gratitude and thankful for all the helps that have been given by all the respected authorities. Special thank goes to my supervisor, Mr. Ma Tien Choon who is always helpful in guiding me in completing this report and the project. His supervision and support in giving information and explaining the objective of project truly help the progression and finally completion of my project.

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ABSTRACT

Pigeon hole is a wooden box with several rectangle holes in it that works similar to letterbox where it usually used in offices. The method of checking letter in pigeon hole has not been updated until today where most people still using the old method of checking the pigeon hole by themselves. Question arises when this method is still being implemented although it was inconvenient and wastes time and energy if there is no update in pigeon hole upon checking. Most system is technology oriented nowadays so a system based on technology like image processing can be implemented on the pigeon hole at the UTeM's FKE office to solve the problems mentioned. In order to use this system, an electronic hardware will need to be built where the hardware consists of a computer system, an internet connection and a webcam for capturing images. The most influential part in building an image processing system is in designing program or software because it will be the place where the captured images is processed according to the written algorithm before deciding an action of sending email. Software of the project are written using Matlab platform in Windows. The process and methods of completing this project is explained in this report. The completed project is fully functional in detecting letter and sending email to notify lecturers when letter is detected.

ABSTRAK

Peti surat seumpama rumah burung merpati atau dalam Bahasa Inggeris dinamakan “Pigeon Hole” adalah sebuah kotak yang mempunyai beberapa lubang berbentuk segiempat. Pada masa kini, tiada kaedah baru diperkenalkan dalam pemeriksaan surat pada kotak surat di mana cara lama iaitu penggunaan tenaga manusia dalam memeriksa surat masih diteruskan. Hal ini menimbulkan persoalan apabila cara lama masih diterus pakai walaupun ia membazirkan masa dan tenaga apabila tiada surat dijumpai dalam kotak semasa melihat kotak surat. Kebanyakan teknologi pada masa kini berorientasikan pemprosesan imej di mana kaedah ini boleh diperkenalkan untuk guna pakai pada kotak surat pejabat FKE, UTeM dalam menyelesaikan masalah yang dibincangkan. Bagi membolehkan sistem ini digunakan, perkakasan elektronik yang terdiri daripada sistem komputer, kemudahan internet dan “webcam” untuk menangkap imej perlu disediakan terlebih dahulu. Bahagian yang memerlukan perhatian yang lebih teliti dalam pembinaan sistem pemprosesan imej ialah semasa proses mereka bentuk program atau perisian kerana ia akan menjadi tempat di mana imej yang ditangkap itu diproses mengikut algoritma yang telah ditulis sebelum mengambil tindakan seterusnya iaitu menghantar e-mel. Perisian projek ditulis atau dibina menggunakan Matlab dalam Windows. Proses dan langkah untuk menyiapkan projek dijelaskan dalam laporan ini. Kesudahan yang dikecapi untuk projek ini ialah projek telah disiapkan dengan sempurna di mana ia dapat melakukan semua operasi seperti mengesan kewujudan surat dan menghantar e-mel kepada pensyarah sebagai pemberitahuan.

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LIST OF ABBREVIATIONS

M	-	Measurable value (time)
T	-	Total time
T1	-	Time needed to detect letter
T2	-	Time to clear the pigeon hole of letter or packages
N	-	Number of pigeon hole (constant)
W	-	Watt
MP	-	Megapixel
m	-	Meter
D	-	Dimension

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CHAPTER 1

INTRODUCTION

This topic will include the problem statement, objectives and project scope for the project. Problem statement will include the problems that need to be solved by this project. Objectives will explain the requirement and solution that the project can provide. The limits of functionality and boundary of the project is under the topic of project scope.

1.1 Overview of the project and report

Image processing technology has become famous nowadays because it is able to solve most problems regarding to images. One of its important components is the device to capture images like webcam and camera. Software plays an important role in image processing, in order to properly analyze and do changes on pictures. The purpose of development of this project is to solve the problem regarding to letter in the pigeon hole at FKE's office. Pigeon hole is a wooden box with several rectangle holes in it where it usually been used in offices. Pigeon hole works similar to letterbox where letter or memo for specific person will be placed in their letterbox.

For this project, a hardware consists of a webcam will be used to capture image of the pigeon hole every 15 minutes while a software will be designed to process the picture that have been taken. Next, letter that has been detected by the software will send an email

towards the recipients to notify him or her about it by showing messages of “You Have Mail”. The purpose of this project is to save lecturers time in checking their pigeon hole every day. This project will also be useful for security, manufacturing and item management purposes.

During the development of this project, it is found that there are several methods or language tools to write the programs like Matlab, Visual Basic C++ and OpenCV to name a few. For the process of software development in this report, the language tool of Matlab with Image Processing Toolbox is used.

Problem statement will discuss on problems regarding to current pigeon hole systems. Objectives describe about the requirement needed and the solution. Limits or boundary of the project is explained in project scope. The comparison of this project with concurrent product in the market and the methods of product development are described in literature review. Methodology explains about the process or steps in developing the project to completion. The completed project was able to detect letter in the pigeon hole and send email to lecturer. The project’s functionality details are explained in the topic of analysis and discussion.

1.2 Problem Statement

Lecturers at FKE need to check their pigeon hole frequently to avoid incident of not noticing important letter which require urgent action before reaching due date and this require time and energy which will be wasted if there is no letter upon checking because the time used to check letter can be used for more important works. The mentioned problems can be solved with this project where lecturer will only need to check their pigeon hole when they receive an email from the project so it saved their time, energy and keep important letters under scheduled.

From the problem statement or description, the problems that need to be solved can be listed below which are;

1. Not noticing important letter that need urgent action before reaching due date.
2. Wasting time and energy if there is no update in pigeon hole upon checking.
3. It is not convenient to frequently check pigeon hole.

1.3 Objective

There are several objectives that need to be accomplished for this project. In order to create a successful project which will be able to solve the all the problem regarding to the current pigeon hole systems, the listed objectives have to be accomplished;

1. To design an image processing algorithm for detecting letter in pigeon hole.
2. To develop software that notify lecturer via email when letter is detected.
3. To verified the image processing algorithm designed for its functionality in different brightness and distances.

An image processing algorithm is designed or developed using programming tool of Matlab to detect letter in pigeon hole. The software developed will detect letter when there is changes detected between the base pictures and current pictures taken by the webcam. The function of notification is important because it determines the full functionality of the project. This is because without the notification function, lecturer will not be able to know the current updates of their pigeon hole. Several testing is conducted towards the project functionality in term of different brightness and distance. A small scaled pigeon hole was also build to enable continuous testing of the project functionality where it serves as the testing equipment and prototype for the project. For hardware, a webcam need to be fixed it position in order to ensure the project functioning because if the webcam changed its position the coordination of the software have to be redone or in other word, the project will not be able to function properly.

1.4 Project Scope

Every project or product has its limits or boundary. This project has its own small limits in order to function properly. The project scope is listed below.

- Functionality covers the size area of the pigeon hole only.
- No real time functionality where pictures will be taken over specified range of time. (For example: 15 minutes)
- Fixed position webcam.
- The pigeon hole position cannot be changed.
- Need to be used on computer that has internet connection and no blocked server.
- Pigeon hole must have open space and no glasses attached.
- Only email notification will be sent to owners of letter.

CHAPTER 2

LITERATURE REVIEW

In this topic, a comparison between several products will be done where the methods, functionality, and other product characteristics will be taken into account for comparison to determine the best solution or methods and how the product created in this project will stand better than current product in the market. Besides that, comparison between methods to complete an image processing software from resources like paper, website and available product has been analyzed to determine the best option to be implemented into the development of the project.

2.1 Comparison between products

There are few available software and device that can be used for this project but it has some disadvantages where it may not reach the functionality requirement required for this project. The software and device mentioned are as shown with its disadvantages.

Table 2.1: Product's specification

Products	“You Have Mail” Project	Webcam Zone Trigger	WebcamXP	Video Surveillance 4 WebCam System
Criterion				
Instrument	Software	Software	Software	Hardware and software
Multiple detection	Yes. Has the region of interest function so it can detect a few specific areas in an image.	No. Can only detect the whole area perspective of an image.	No. Does not have region of interest function to detect specific area in an image.	Yes, but can only detect up to 4 areas because every area need one webcam.
More than one email notification	Yes. Can send to more than one email for every different area.	No. Only one email can be send at a time.	No. Only one email can be send at a time.	No. Only one email can be send at a time.
User-friendly	Yes. A one click of run to start the program.	Yes. A good interface to run program and setting.	Yes. A good interface to run program and setting.	Yes. A simple interface to run the program.
Editing functionality	Yes, but require little experience in programming.	Yes. Can be edited easily by computer user.	Yes. Can be edited easily by computer user.	Yes. Can be edited after installing its software.
Cost (\$)	Free	44.95	119.95	98.00

From the above table we can see that my project (“You Have Mail” A Pigeon Hole Monitoring System for FKE Office) is a better selection to be used compared to the other products in order to meet the objectives and is a better alternative in term of functionality and cost of operation so it is beneficial to be developed. A better way of selection can be done by using the weighted objective method.

Table 2.2: Comparison of products using weighted objective method

Products \ Criterion	Weight	“You Have Mail” Project	Webcam Zone Trigger	WebcamXP	Video Surveillance 4 WebCam System
Multiple detection	0.35	3	1	1	2
More than one email notification	0.35	3	1	1	1
User-friendly	0.1	2	3	3	2
Editing functionality	0.1	1	3	3	1
Cost (\$)	0.1	3	2	1	1
Total	1	2.7	1.5	1.4	1.45
		Chosen			
<u>Score:</u>	1 – poor	2 – average		3 – good	

As the above table shown, weighted objective method of comparison shows that the software created is the best alternative to be used for this project because other products have it disadvantages that does not meet the requirement or objectives of the project. Zone trigger and WebcamXP have the disadvantages of not supporting multiple detections and no multiple email notification functionality. Both do not come in free version. For “Video Surveillance 4 WebCam System”, it comes with software and hardware so user needs to configure both items and it makes the tools less convenient compared to other product. Besides that, it cost more in its operation if the user wanted to check changes in more areas because it needs more than one webcam in order to function as mentioned. The software created able to solve the disadvantages in the three products by providing multiple detection on an image with region of interest function and multiple email notification where more than one email can be add into the program and the product created by this project is free because it is build using an open source language tools.